Branch of Forest Insect and Disease Prevention and Control
Division of Timber Management
Region 4 Forest Service
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Status of the Mountain Pine Beetle Outbreak in the Warm River Area of the Targhee National Forest

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INTRODUCTION

The following is a report on the results of a survey conducted from October 18 through 22, 1971, in designated cutting units of the Warm River Timber Sale area on the Targhee National Forest. The objectives of the survey were to obtain the following estimates:

1. Remaining merchantable volumes in cutting units.

2. Current levels of the mountain pine beetle infestation in sale units.

3. Cumulative losses resulting from insects and other causes in cutting units.

These estimates were used to make recommendations for disposition of the timber in the cancelled Warm River Sale.

The survey data also provide insight into the trend and impact of the mountain pine beetle outbreak in this portion of the Targhee National Forest. The purpose of this report is to document the results of the survey in this regard.

METHODS

The Warm River Sale area was divided into seven units (see map in Appendix). Two-man crews were assigned to each unit to collect the survey data. One crew member was a certified cruiser who was responsible for all cruise measurements and photographic interpretation. The other member was an entomologist who detected and classified insect attacks and assisted in taking measurements.

Two concurrent variable plot cruises were conducted to obtain the survey data. A relaskop was used to measure critical angles. The methods used during these cruises will be discussed separately.

Timber Volume Cruise

Each crew was provided aerial photographs with cruise lines and plot intervals designated within specific cutting units. A reference point was established at the start of every cruise line. A 100-foot tape and compass were used to measure distance and direction, respectively. At each plot center, a wooden stake was driven into the ground and labeled with the plot number, distance, and direction to the next plot. All plots were numbered consecutively in each unit. A 20 BAF (basal area factor) was used on these plots.

Trees 8 inches d.b.h. (diameter at breast height) and larger were classified as green merchantable, currently infested, or dead (killed by insect and other causes). These categories were measured as follows:

1. Green merchantable. The diameter and height of the first merchantable lodgepole pine to the right of the measuring tape looking back towards the last plot was recorded. All other live merchantable lodgepole pine, which were measured as being count trees, were recorded as having the same diameter and height as the first tree.

2. Current attacks. The diameter and height of the first 1971 attack to the right of the tape looking back toward the last plot was measured. For all other hits, the diameters were measured but the heights were estimated using the first tree as a guide.

3. Dead trees. All dead trees were measured in the same manner as the current attacks.

On borderline trees, the cruiser visually determined with the relaskop whether the tree was in or out. Trees that were difficult to see were measured with a tape. Diameters were measured to the nearest tenth of an inch and heights were measured to the nearest foot. A computer program was used to obtain data summaries.

Insect Status Cruise

A 10 BAF was used to record count trees on insect cruise plots. Trees 8 inches d.b.h. and above were recorded in 2-inch diameter classes as follows: 9.0 to 10.9 inches d.b.h. = 10-inch class; 11.0 to 12.9 inches d.b.h. = 12-inch class, etc. The 8-inch class only included trees from 8.0 to 8.9 inches d.b.h. Insect plots were sampled at a frequency of one and one-half times the number of timber plots. In some cases, both the data were taken from the same plot center.

The plots were established at even intervals along the timber cruise lines. Insect attacked trees were recorded as either 1971 hits or snags (see summary sheets in Appendix). A computer program was used to obtain unit summaries.

RESULTS AND DISCUSSION

Sawtimber stands in the Warm River Sale area have been severely damaged over the last 5 years. Control programs were undertaken from 1967 through 1970, but these efforts only slowed the rate of mortality and did not limit the spread of the infestation.[1/] Rampant infesta-

1/ Mountain pine beetle conditions in the proposed control area on the Targhee National Forest. 1970. 5pp, typed.

tions to the south of the sale area on the Forest and to the east in Yellowstone National Park, along with buildups from within some control areas, sustained the outbreak. Due to the spread of the infestation from south to north, stands in the southern units of the sale area were damaged more severely than those further north. However, following termination of the control program in 1970, the insect populations and subsequent tree losses increased in the northern units. Damage to stands by winter storms, mostly in the form of top breakage, added to the beetle depredations. A resumé of stand volume data follows:

Unit[a/]	Live Merchantable Vol. Per Acre	Net Volume Per Acre[b/]	Total Dead Volume Per Acre	Percent Dead Volume in Stand
1	7,900	6,000	6,100	43.0
2	8,600	6,600	7,200	46.0
3	11,000	8,500	4,900	31.0
4	13,300	10,200	4,500	25.0
5	10,800	8,300	2,500	19.0
6	11,900	9,200	3,000	20.0
7	11 700	9 000	6 900	37.0
mean	10,800	8,200	5,000	31.5

a/ See map in Appendix for locations of units.

b/ Minus 23 percent natural and scaling defect.

A statistical analysis of between plot variation for the timber volume data follows:

Unit	Number of Plots	Mean[a/] (Volume)	Standard Deviation	Standard Error (%)	Coefficient of Variation (%)
1	17	13,453	6,355	11.5	47
2	50	12,259	8,018	9.2	65
3	47	13,396	7,105	7.7	53
4	30	16,426	7,689	8.5	47
5	41	11,786	7,110	9.4	60
6	44	13,632	9,421	10.4	69
7	28	17,566	9,057	9.7	52

a/ Means do not include volume of current attacks.

Mountain pine beetle trend studies conducted in Yellowstone National Park and elsewhere have shown that about 30 percent of trees 5 inches and larger are killed during the course of an epidemic.[1/] Losses in Units 1 and 2 are approaching this level, but those further north have not reached this point. By 1974, all units should reach this maximum loss threshold and the outbreak should subside. A summary of the insect cruise data follows:

Unit	Acres	Number of Sample Points	1971 Attacks Per Acre	Total Attacks Per Acre Before 1971	Total Mortality (Trees Per Acre)	Percent of Stand Mortality
1	270	26	5	24	29	23
2	1,600	86	18	20	38	29
3	2,100	68	13	10	23	14
4	1,200	49	12	16	28	18
5	1,600	66	13	7	20	13
6	1,800	72	6	16	22	16
7	500	58	6	29	36	22

A statistical analysis of between plot variation for the insect cruise data follows:

Unit	Nature of Attacked Tree	Mean*	Standard* Deviation	Standard* Error	Coefficient of Variation (%)
1	new	5.02	10.34	2.03	205.98
	snags	23.78	24.14	4.73	101.51
	total	28.80	23.06	4.52	80.07
2	new	18.09	26.92	2.90	148.81
	snags	19.56	30.78	3.32	157.36
	total	37.65	35.66	3.85	94.71
3	new	12.74	20.99	2.55	164.70
	snags	10.21	18.52	2.25	181.36
	total	22.95	27.07	3.28	117.94
4	new	12.17	21.94	3.13	180.28
	snags	15.70	25.39	3.62	161.72
	total	27.88	30.39	4.34	109.00

1/ Mountain pine beetle trend and impact study in Yellowstone National Park. 1971. 4pp, typed.

Unit	Nature of Attacked Tree	Mean*	Standard* Deviation	Standard* Error	Coefficient of Variation (%)
5	new	12.73	29.76	3.66	233.78
	snags	6.91	18.33	2.26	265.27
	total	19.64	35.00	4.31	178.21
6	new	6.22	14.37	1.69	231.03
	snags	15.96	20.72	2.44	129.82
	total	22.19	25.42	3.00	114.56
7	new	6.40	21.63	2.84	337.97
	snags	29.12	31.80	4.18	109.20
	total	35.52	35.57	4.68	100.14

*Figures in these columns are in terms of trees per acre.

The beetle outbreak is expected to increase again in 1972. There is no reason to suspect that the infestation will subside until it has run its normal course. The major damage to merchantable stands will occur by 1973 in Units 1, 2, and 7 and by 1974 in all other units.

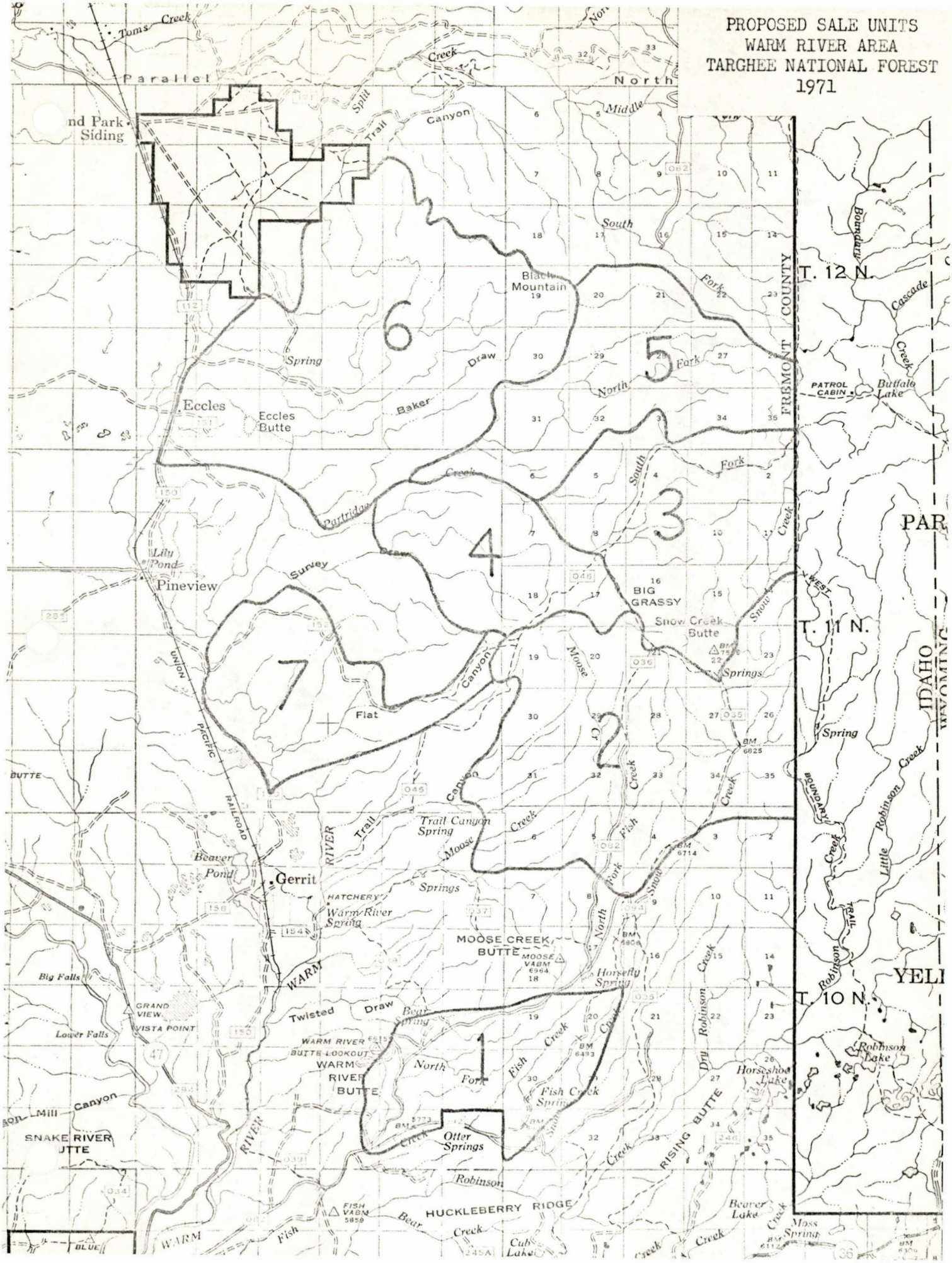
The beetle outbreak is expected to move further north onto the Moose Creek Plateau and cause severe damage in the next 2 to 3 years.

RECOMMENDATIONS

Most of the merchantable volumes of timber in the Warm River Sale area will be seriously reduced in the next year or two. Therefore, the most practical approach is to harvest the threatened timber before it is lost. Chemical or other means of control is not recommended.

The two cruises conducted in the Warm River area were cursory and the data are highly variable, as indicated in the preceding statistical summaries. It should be emphasized that the results only provide an indication of the remaining volumes, current levels of the beetle infestation, and cumulative losses in sale units. Intensive surveys will have to be conducted in each unit to obtain satisfactory estimates of these factors.

APPENDIX


PROPOSED SALE UNITS
WARM RIVER AREA
TARGHEE NATIONAL FOREST
1971
T. 12 N.
T. 11 N.
T. 10 N.
FREMONT COUNTY
IDAHO
WYOMING
Toms Creek
Parallel
North
Split Trail Canyon
Middle
South
Fork
Boundary
Cascade Creek
PATROL CABIN
Buffalo Lake
Black Mountain
Spring Draw
Baker
North Fork
Eccles
Eccles Butte
Partridge Creek
South Fork
Lily Pond
Pineview
Survey Draw
BIG GRASSY
Snow Creek Butte
Springs
Moose Creek
Flat
UNION PACIFIC RAILROAD
Trail Canyon Spring
Beaver Pond
Gerrit
HATCHERY
Warm River Spring
MOOSE CREEK BUTTE
Horsefly Spring
Big Falls
GRAND VIEW
VISTA POINT
Lower Falls
Twisted Draw
Bear Spring
WARM RIVER BUTTE LOOKOUT
WARM RIVER BUTTE
Fish Creek Spring
Robinson Lake
Horseshoe Lake
Dry Robinson Creek
Little Robinson Creek
TRAIL
SNAKE RIVER BUTTE
Otter Springs
RISING BUTTE
HUCKLEBERRY RIDGE
Beaver Lake
Moss Spring
Bear Creek
Cub Lake
1
2
3
4
5
6
7

SURVEY
10/28/71

POPULATION STAND TABLE
TARGHEE NF UNIT 1
HOST SPECIES IS LODGEPOLE PINE THE INSECT NAME IS MOUNTAIN PINE BEETLE

THE METHOD OF SAMPLING WAS VARIABLE THE FIGURES IN THIS TABLE ARE BASED ON A SAMPLE OF 26 PLOTS, AND REPRESENT AN AREA OF 0 ACRES.

BAF WAS 10

THIS TABLE ONLY INCLUDES HOST TREES

NUMBERS OF TREES

PER ACRE

DBH	LIVE	NEW	OLD	SNAG	TOT. DEAD	PERCT. DEAD	TOTAL	PERCENTILE
7.0- 8.9	0	0	0	2.204	2.204	100.000	2.204	7.652
9.0- 10.9	0	0	0	7.052	7.052	100.000	7.052	24.487
11.0- 12.9	0	1.959	0	4.897	6.856	100.000	6.856	23.806
13.0- 14.9	0	1.799	0	3.958	5.757	100.000	5.757	19.989
15.0- 16.9	0	.826	0	5.234	6.060	100.000	6.060	21.043
17.0- 18.9	0	.435	0	.435	.871	100.000	.871	3.023
TOTAL	0	5.02	0	23.78	28.80	100.00	28.80	100.00
PERCENT	0	17.43	0	82.57	100.00			

BASAL AREA PER ACRE FOR HOST TREES

LIVE	NEW	OLD	SNAG	TOT. DEAD	TOTAL
0	5.3846	0	20.7692	26.1538	26.1538

SURVEY
10/28/71

POPULATION STAND TABLE
TARGHEE NF UNIT 2
HOST SPECIES IS LODGEPOLE PINE THE INSECT NAME IS MOUNTAIN PINE BEETLE

THE METHOD OF SAMPLING WAS VARIABLE THE FIGURES IN THIS TABLE ARE BASED ON A SAMPLE OF 86 PLOTS, AND
REPRESENT AN AREA OF ____ ACRES.

BAF WAS 10

THIS TABLE ONLY INCLUDES HOST TREES

NUMBERS OF TREES
PER ACRE

DBH	LIVE	NEW	OLD	SNAG	TOT. DEAD	PERCT. DEAD	TOTAL	PERCENTILE
7.0- 8.9	0	.999	0	3.331	4.330	100.000	4.330	11.503
9.0- 10.9	0	3.198	0	4.477	7.675	100.000	7.675	20.387
11.0- 12.9	0	4.590	0	3.997	8.587	100.000	8.587	22.809
13.0- 14.9	0	3.807	0	4.242	8.049	100.000	8.049	21.381
15.0- 16.9	0	3.914	0	1.999	5.913	100.000	5.913	15.706
17.0- 18.9	0	1.579	0	1.513	3.093	100.000	3.093	8.215
TOTAL	0	18.09	0	19.56	37.65	100.00	37.65	100.00
PERCENT	0	48.04	0	51.96	100.00			

BASAL AREA PER ACRE FOR HOST TREES

LIVE	NEW	OLD	SNAG	TOT. DEAD	TOTAL
0	18.0233	0	16.7442	34.7674	34.7674

SURVEY
12/29/71

POPULATION STAND TABLE
TARGHEE NF UNIT 3
HOST SPECIES IS LODGEPOLE PINE THE INSECT NAME IS MOUNTAIN PINE BEETLE

THE METHOD OF SAMPLING WAS VARIABLE THE FIGURES IN THIS TABLE ARE BASED ON A SAMPLE OF 68 PLOTS. AND REPRESENT AN AREA OF OACRES.

BAF WAS 10

THIS TABLE ONLY INCLUDES HOST TREES

NUMBERS OF TREES PER ACRE

DBH	LIVE	NEW	OLD	SNAG	TOT. DEAD	PERCT. DEAD	TOTAL	PERCENTILE
7.0- 8.9	0	.843	0	0	.843	100.000	.843	3.671
9.0- 10.9	0	1.887	0	2.157	4.044	100.000	4.044	17.620
11.0- 12.9	0	3.183	0	2.434	5.617	100.000	5.617	24.472
13.0- 14.9	0	3.164	0	1.788	4.952	100.000	4.952	21.575
15.0- 16.9	0	2.001	0	2.001	4.002	100.000	4.002	17.434
17.0- 18.9	0	1.564	0	1.931	3.495	100.000	3.495	15.227
TOTAL	0	12.74	0	10.21	22.95	100.00	22.95	100.00
PERCENT	0	55.51	0	44.49	100.00			

BASAL AREA PER ACRE FOR HOST TREES

LIVE	NEW	OLD	SNAG	TOT. DEAD	TOTAL
0	12.9412	0	11.0294	23.9706	23.9706

SURVEY
10/28/71

POPULATION STAND TABLE
TARGHEE NF UNIT 4
HOST SPECIES IS LODGEPOLE PINE THE INSECT NAME IS MOUNTAIN PINE BEETLE

THE METHOD OF SAMPLING WAS VARIABLE THE FIGURES IN THIS TABLE ARE BASED ON A SAMPLE OF 49 PLOTS, AND

REPRESENT AN AREA OF OACRES.

BAF WAS 10

THIS TABLE ONLY INCLUDES HOST TREES

NUMBERS OF TREES

PER ACRE

DBH	LIVE	NEW	OLD	SNAG	TOT. DEAD	PERCT. DEAD	TOTAL	PERCENTILE
7.0- 8.9	0	1.754	0	1.169	2.923	100.000	2.923	10.487
9.0- 10.9	0	2.993	0	4.490	7.484	100.000	7.484	26.846
11.0- 12.9	0	1.559	0	2.598	4.158	100.000	4.158	14.914
13.0- 14.9	0	2.291	0	2.482	4.773	100.000	4.773	17.121
15.0- 16.9	0	1.608	0	2.192	3.800	100.000	3.800	13.633
17.0- 18.9	0	1.963	0	2.772	4.735	100.000	4.735	16.986
TOTAL	0	12.17	0	15.70	27.88	100.00	27.88	100.00
PERCENT	0	43.67	0	56.33	100.00			

BASAL AREA PER ACRE FOR HOST TREES

LIVE	NEW	OLD	SNAG	TOT. DEAD	TOTAL
0	11.8367	0	15.5102	27.3469	27.3469

SURVEY
10/28/71

POPULATION STAND TABLE
TARGHEE NF UNIT 5
HOST SPECIES IS LODGEPOLE PINE THE INSECT NAME IS MOUNTAIN PINE BEETLE

THE METHOD OF SAMPLING WAS VARIABLE THE FIGURES IN THIS TABLE ARE BASED ON A SAMPLE OF 66 PLOTS, AND REPRESENT AN AREA OF 0ACRES.

BAF WAS 10

THIS TABLE ONLY INCLUDES HOST TREES

NUMBERS OF TREES
PER ACRE

DBH	LIVE	NEW	OLD	SNAG	TOT. DEAD	PERCT. DEAD	TOTAL	PERCENTILE
7.0- 8.9	3	1.735	0	1.302	3.038	100.000	3.038	15.469
9.0- 10.9	0	3.611	0	.833	4.445	100.000	4.445	22.629
11.0- 12.9	1	2.122	0	1.736	3.858	100.000	3.858	19.644
13.0- 14.9	0	1.843	0	1.984	3.827	100.000	3.827	19.483
15.0- 16.9	0	2.387	0	.543	2.930	100.000	2.930	14.917
17.0- 18.9	0	1.029	0	.514	1.543	100.000	1.543	7.857
TOTAL	4	12.73	0	6.91	19.64	100.00	19.64	100.00
PERCENT	0	64.80	0	35.20	100.00			

BASAL AREA PER ACRE FOR HOST TREES

LIVE	NEW	OLD	SNAG	TOT. DEAD	TOTAL
0	11.3636	0	6.0606	17.4242	17.4242

SURVEY
10/26/71

POPULATION STAND TABLE
TARGHEE NF UNIT 6
HOST SPECIES IS LODGEPOLE PINE THE INSECT NAME IS MOUNTAIN PINE BEETLE

THE METHOD OF SAMPLING WAS VARIABLE THE FIGURES IN THIS TABLE ARE BASED ON A SAMPLE OF 72 PLOTS. AND REPRESENT AN AREA OF DACRES.

BAF WAS 10

THIS TABLE ONLY INCLUDES HOST TREES

NUMBERS OF TREES PER ACRE

DBH	LIVE	NEW	OLD	SNAG	TOT. DEAD	PERCT. DEAD	TOTAL	PERCENTILE
7.0- 8.9	0	0	0	2.785	2.785	100.000	2.785	12.550
9.0- 10.9	0	2.037	0	7.130	9.167	100.000	9.167	41.308
11.0- 12.9	0	1.238	0	2.829	4.067	100.000	4.067	18.327
13.0- 14.9	0	1.429	0	1.559	2.988	100.000	2.988	13.465
15.0- 16.9	0	.895	0	.796	1.691	100.000	1.691	7.620
17.0- 18.9	0	.629	0	.865	1.493	100.000	1.493	6.729
TOTAL	0	6.23	0	15.96	22.19	100.00	22.19	100.00
PERCENT	0	28.06	0	71.94	100.00			

BASAL AREA PER ACRE FOR HOST TREES

LIVE	NEW	OLD	SNAG	TOT. DEAD	TOTAL
0	5.9722	0	11.3889	17.3611	17.3611

SURVEY
10/28/71

POPULATION STAND TABLE
TARGHEE NF UNIT 7
HOST SPECIES IS LODGEPOLE PINE THE INSECT NAME IS MOUNTAIN PINE BEETLE

THE METHOD OF SAMPLING WAS VARIABLE THE FIGURES IN THIS TABLE ARE BASED ON A SAMPLE OF 58 PLOTS, AND
REPRESENT AN AREA OF OACRES.

BAF WAS 10

THIS TABLE ONLY INCLUDES HOST TREES

NUMBERS OF TREES
PER ACRE

DBH	LIVE	NEW	OLD	SNAG	TOT. DEAD	PERCT. DEAD	TOTAL	PERCENTILE
7.0- 8.9	0	1.975	0	2.964	4.939	100.000	4.939	13.906
9.0- 10.9	0	2.213	0	6.006	8.219	100.000	8.219	23.140
11.0- 12.9	0	1.098	0	8.342	9.440	100.000	9.440	26.576
13.0- 14.9	0	.645	0	6.613	7.258	100.000	7.258	20.433
15.0- 16.9	0	.370	0	1.976	2.346	100.000	2.346	6.605
17.0- 18.9	0	.098	0	3.220	3.317	100.000	3.317	9.339
TOTAL	0	6.40	0	29.12	35.52	100.00	35.52	100.00
PERCENT	0	18.02	0	81.98	100.00			

BASAL AREA PER ACRE FOR HOST TREES

LIVE	NEW	OLD	SNAG	TOT. DEAD	TOTAL
0	4.1379	0	26.3793	30.5172	30.5172